

Application No. 10/531,831  
 Response dated: October 2, 2008  
 Reply to Final Office Action of: June 05, 2008

/A.Z./ 10/06/2008

### **Amendments to the Claims:**

This listing of claims will replace all prior versions, and listing, of claims in the application.

### **Listing of Claims:**

1. (Currently Amended) A fibrous nanocarbon characterized by carbon hexagonal plane or stacking thereof, having two directional growth axis to grow two units of carbon nanofibers, whereby; (1) the  $sp^2$  hybrid carbon content of more than 95% per total content; (2) the interlayer spacing  $d_{002}$ , (d-spacing of C(002) profiles determined by X-ray diffraction method) of 0.3360 nm to 0.3800 nm; (3) the (002) plane stacking of more than 4 layers and the aspect ratio of more than 20; (4) the fiber cross-section width/thickness of 2.0 nm to 800 nm; (5) the inclination angle of hexagonal plane alignment for each composed carbon nanofibers to the fiber axis of 0 to 85 degrees; and carbon hexagonal planes stacking along the fiber axis, forming knots (nodes) at intervals of 5 nm to 100 nm, sharing partly the structure or stacking layers in carbon hexagonal planes of each composed carbon nanofibers and connecting periodically to each other, consequently forming ladder-like structure with open parts between each connection units, through which the inner side of the fibrous nanocarbon is open and connected to the outer space, wherein the carbon hexagonal planes align angled to the fibrous nanocarbon axis, and the two unit carbon nanofibers are combined by inter-fiber force or van der-walls Waals force, forming pair structure as a single body.

2. (Currently Amended) A fibrous nanocarbon characterized by carbon hexagonal plane or stacking thereof, having two directional growth axis to grow two units of carbon nanofibers, whereby; (1) the  $sp^2$  hybrid carbon content of more than 95% per total content; (2) the interlayer spacing  $d_{002}$ , (d-spacing of C(002) profiles determined by X-ray diffraction method) of 0.3360 nm to 0.3800 nm; (3) the (002) plane stacking of more than 8 layers; (4) the width/thickness of fiber cross-section of 2.0 nm to 800 nm; (5) the aspect ratio is more than 20; and (6) bonding of two unit carbon nanofibers with said (1) to (5) features at 0.5 nm~30 nm distance by the inter-fiber force between the two unit fibers from the beginning of fiber formation,

wherein the carbon hexagonal planes align angled to the fibrous nanocarbon axis, and the two unit carbon nanofibers are combined by inter-fiber force or van der-walls Waals force, forming pair structure as a single body.

3. (Currently Amended) A preparation method of fibrous nanocarbon of claim 1 through catalytic pyrolysis of gaseous or liquid carbon sources, wherein said catalyst is unsupported bulk metal or particulate metal, and said bulk metal or particulate metal are reduced and simultaneously formed into very fine metal particles by hydrogen or hydrogen radical during the catalyst reduction process,

wherein the catalyst is prepared by the steps comprising of: preparing an alloy of primary metal and secondary metal; reducing the alloy to form an alloy-catalyst; cooling the alloy-catalyst for passivation; reducing the cooled alloy-catalyst at the temperature ranges of 450~550°C under the hydrogen-helium mixed gases containing 1~40v/v % hydrogen; and reacting the reduced alloy-catalyst with the gaseous or liquid carbon sources, and

wherein transition metals such as Fe, Ni or Co active to said carbon sources are used as primary metals; to assist dispersion of said primary metals, the addition of 5 to 95 wt % secondary metals inactive to said carbon sources results in formation of fine particle catalyst; and hydrocarbon/hydrogen gas mixtures containing 2 to 95v/v % hydrogen are introduced over said fine particle catalyst at the rate of 0.5 to 30 sccm per 1 mg catalyst at the temperatures of 380 to 750°C for the reaction time of 2 min to 48 h.

4. (Currently Amended) A preparation method of fibrous nanocarbon of claim 2 through catalytic pyrolysis of gaseous or liquid carbon sources, wherein said catalyst is unsupported bulk metal or particulate metal, and said bulk metal or particulate metal are reduced and simultaneously formed into very fine metal particles by hydrogen or hydrogen radical during the catalyst reduction process,

wherein the catalyst is prepared by the steps comprising of: preparing an alloy of primary metal and secondary metal; reducing the alloy to form an alloy-catalyst; cooling the alloy-catalyst for passivation; reducing the cooled alloy-catalyst at the temperature ranges of 450~550°C under the hydrogen-helium mixed gases containing 1~40v/v % hydrogen; and reacting the reduced alloy-catalyst with the gaseous or liquid carbon sources, and

wherein transition metals such as Fe, Ni or Co active to said carbon sources are used as primary metals; to assist dispersion of said primary metals, the addition of 5 to 95 wt % secondary metals inactive to said carbon sources results in formation of fine particle catalyst; and hydrocarbon/hydrogen gas mixtures containing 2 to 95 v/v % hydrogen are introduced over said fine particle catalyst at the rate of 0.5 to 30 sccm per 1 mg catalyst at the temperatures of 380 to 750 °C for the reaction time of 2 min to 48 h.

5. (Cancelled)

6. (Cancelled)

7. (Currently Amended) The preparation method according to ~~claim 5~~ claim 3, wherein said catalyst contains 5 to 95 wt % composition ratio of said primary metals and secondary metals.

8. (Currently Amended) The preparation method according to ~~claim 6~~ claim 4, wherein said catalyst contains 5 to 95 wt % composition ratio of said primary metals and secondary metals.

9. (Cancelled)

10. (Cancelled)

11. (Cancelled)

12. (Cancelled)

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Cancelled)